

# Session 6: Future of Alternative Fuels & Bioenergy in Tennessee



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- Farm Outreach & Policy Advocate-



cleanenergy.org

Southern Alliance for  
Clean Energy



# ***TN's Biofuels and Biopower Future***

**TN Alternative Fuels and Bioenergy  
Conference**

Montgomery Bell State Park, TN

August 17, 2010







# Energy Security

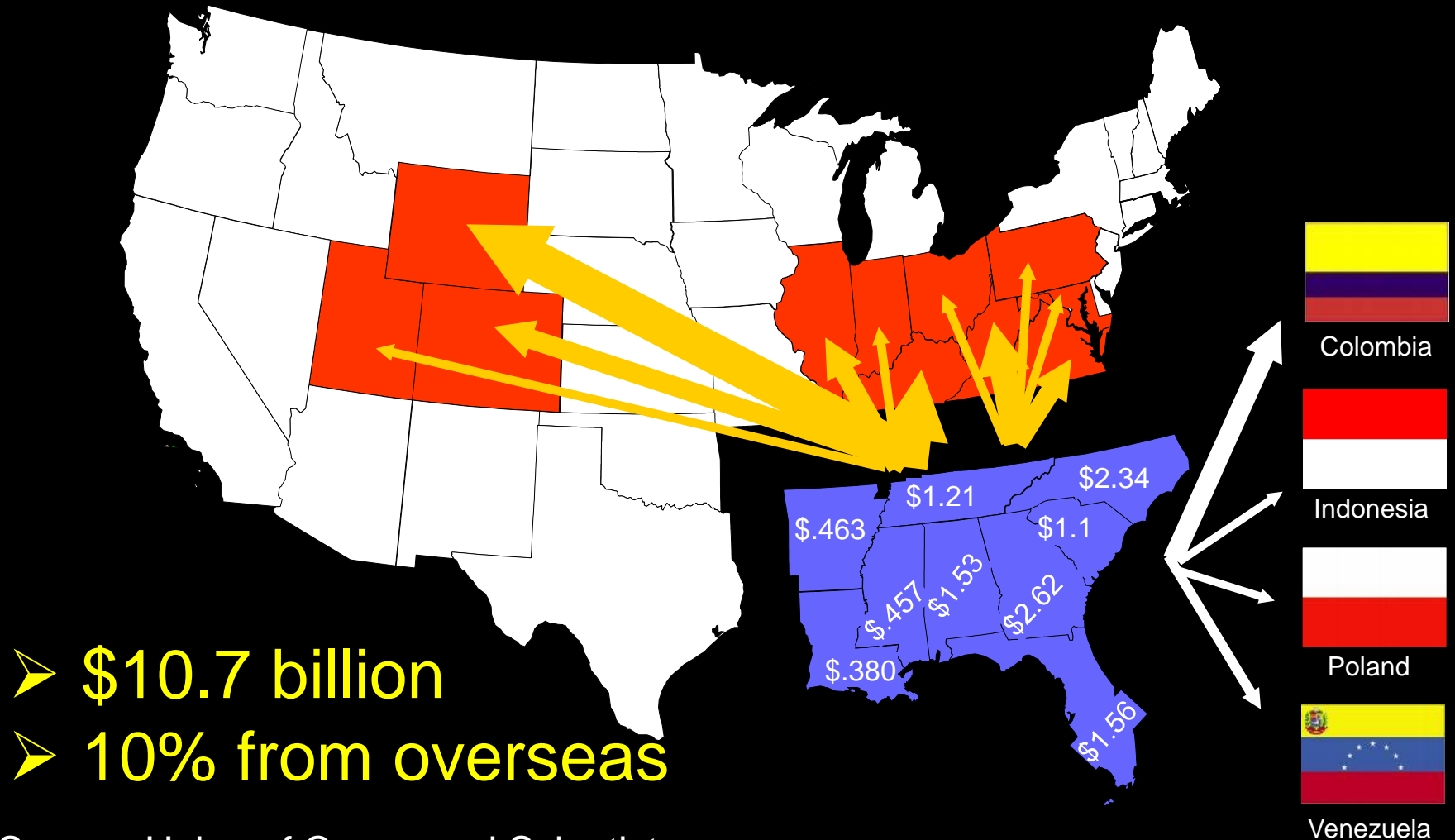


# Climate Change



# Coal is a Wealth Transfer

Annual Coal Import Expenditures, 2008 (billion \$)



Source: Union of Concerned Scientists, analysis of EIA and FERC data.



# Opposition

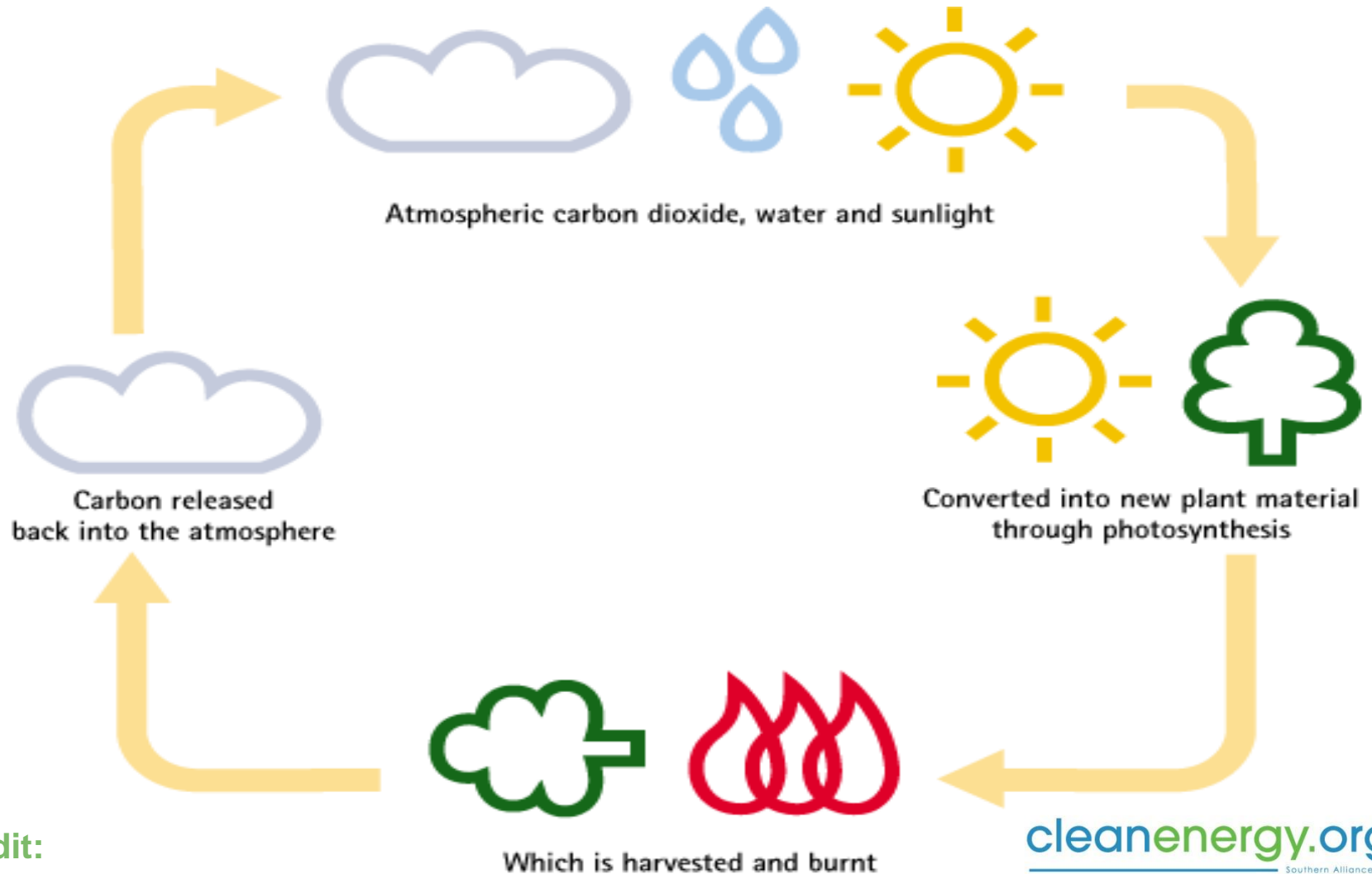


  
**NO**  
**BIOMASS**  
**INCINERATORS**



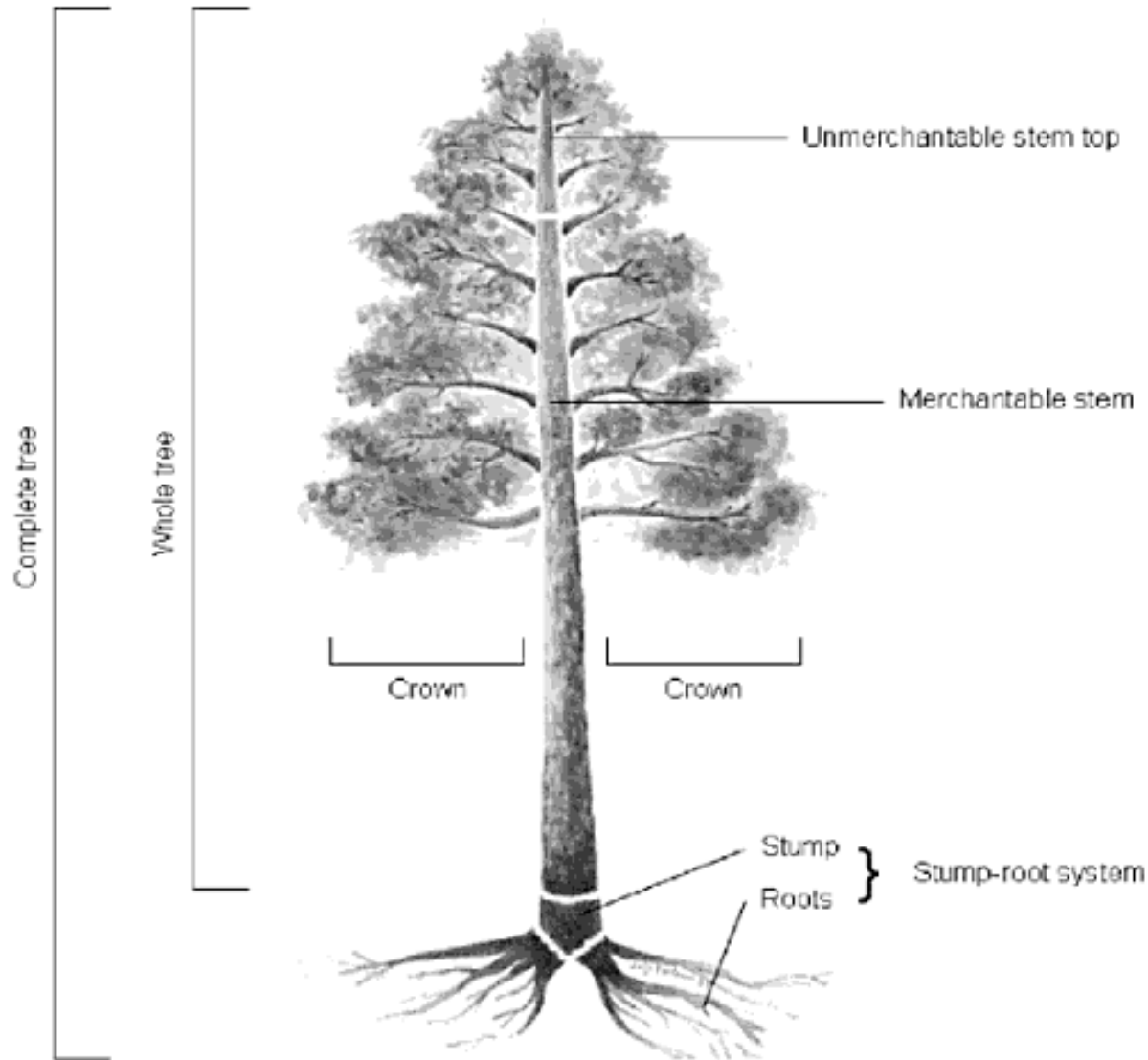


# No Free Pass on Carbon



Credit:  
Susan LeVan-Green, NCSU

# What is Biomass?



Source: “Sustainable Use of Forest Biomass for Energy: A Synthesis with Focus on the Baltic and Nordic Region,” by Röser, Dominik, Antti Asikainen, Karsten Raulund-Rasmussen and Inge Stupak. Springer, 2008.

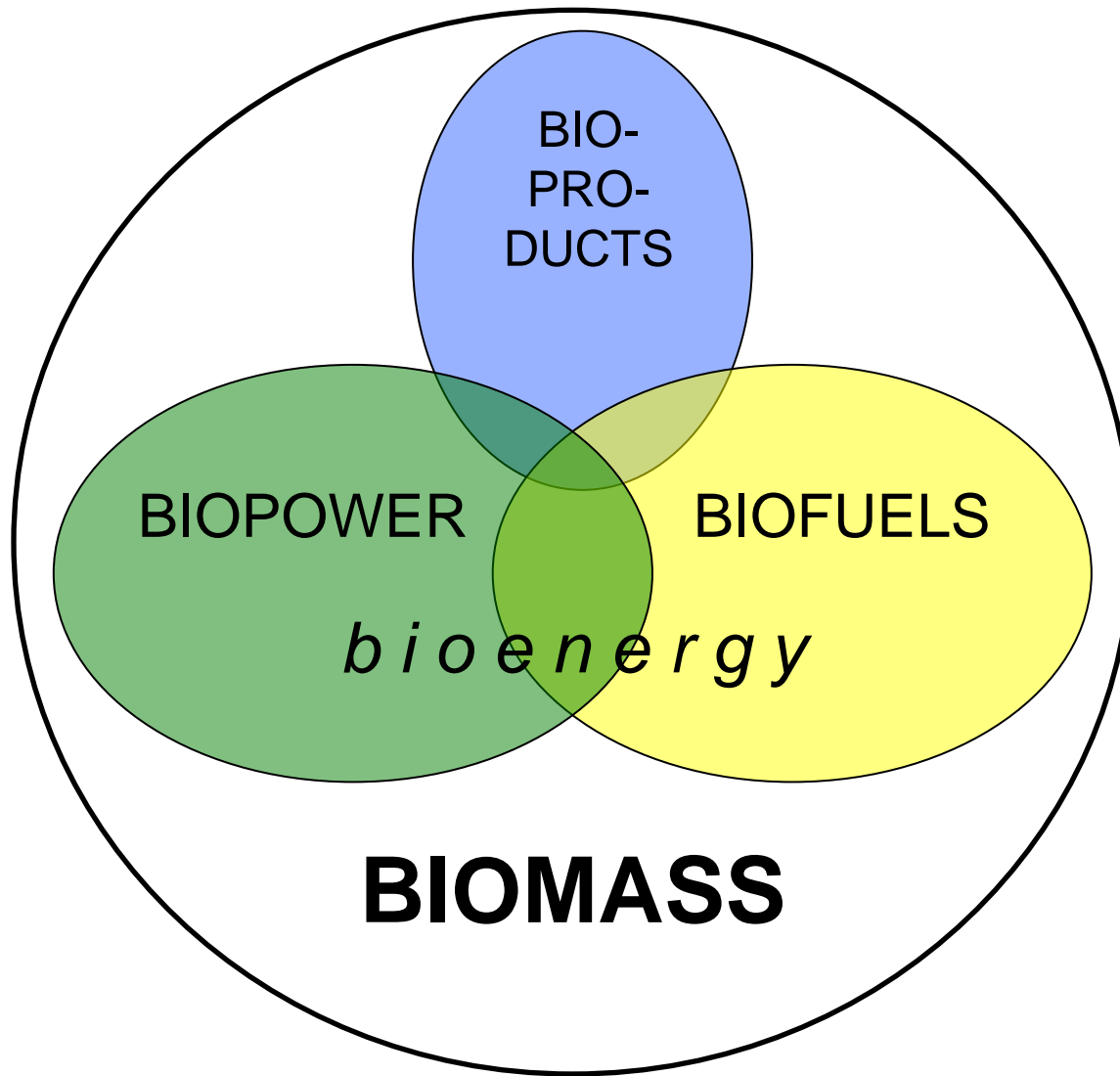




# Opportunities

- **Energy Security: Integrated Biorefineries**
- **Climate Change: Shut 'em down!**
- **Coal Wealth Transfer: Biopower**
- **Opposition: Sustainability**
- **Carbon Accounting: Biochar**
- **Definition: Consensus**

# Integrated Biorefineries



## The Bio-based Universe:

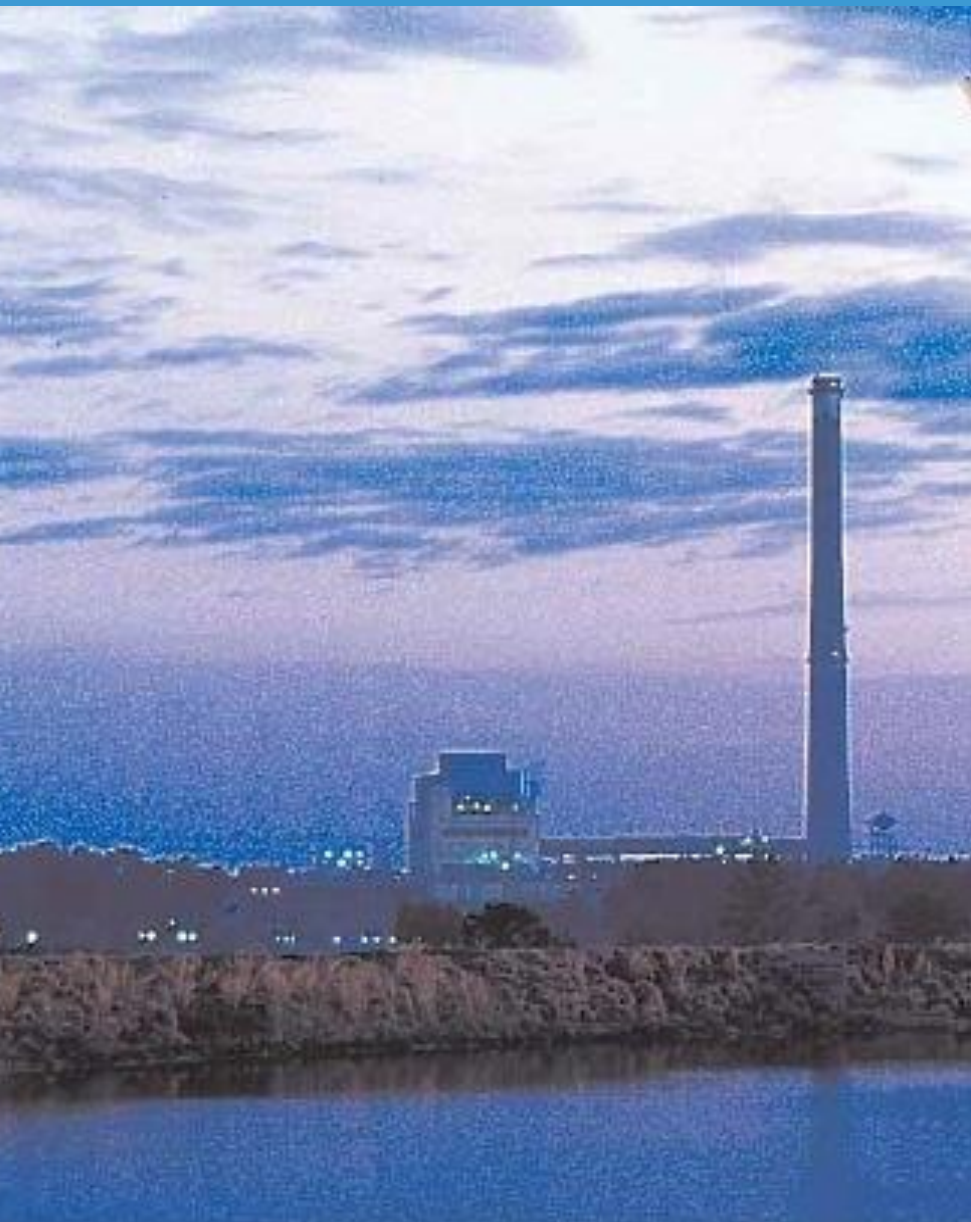
- bio-products
- biofuels
- biopower

• [cleanenergy.org](http://cleanenergy.org)  
*Plus thermal!*





# Decommissioning & Repowering



- Plant Mitchell Repowering (coal to biomass conversion, 96MW)
- Can make economic sense for pollution control reasons alone

# Biopower



Source of economic data:  
Hodges & Rahmani  
<http://bit.ly/BiopowerEconomics>

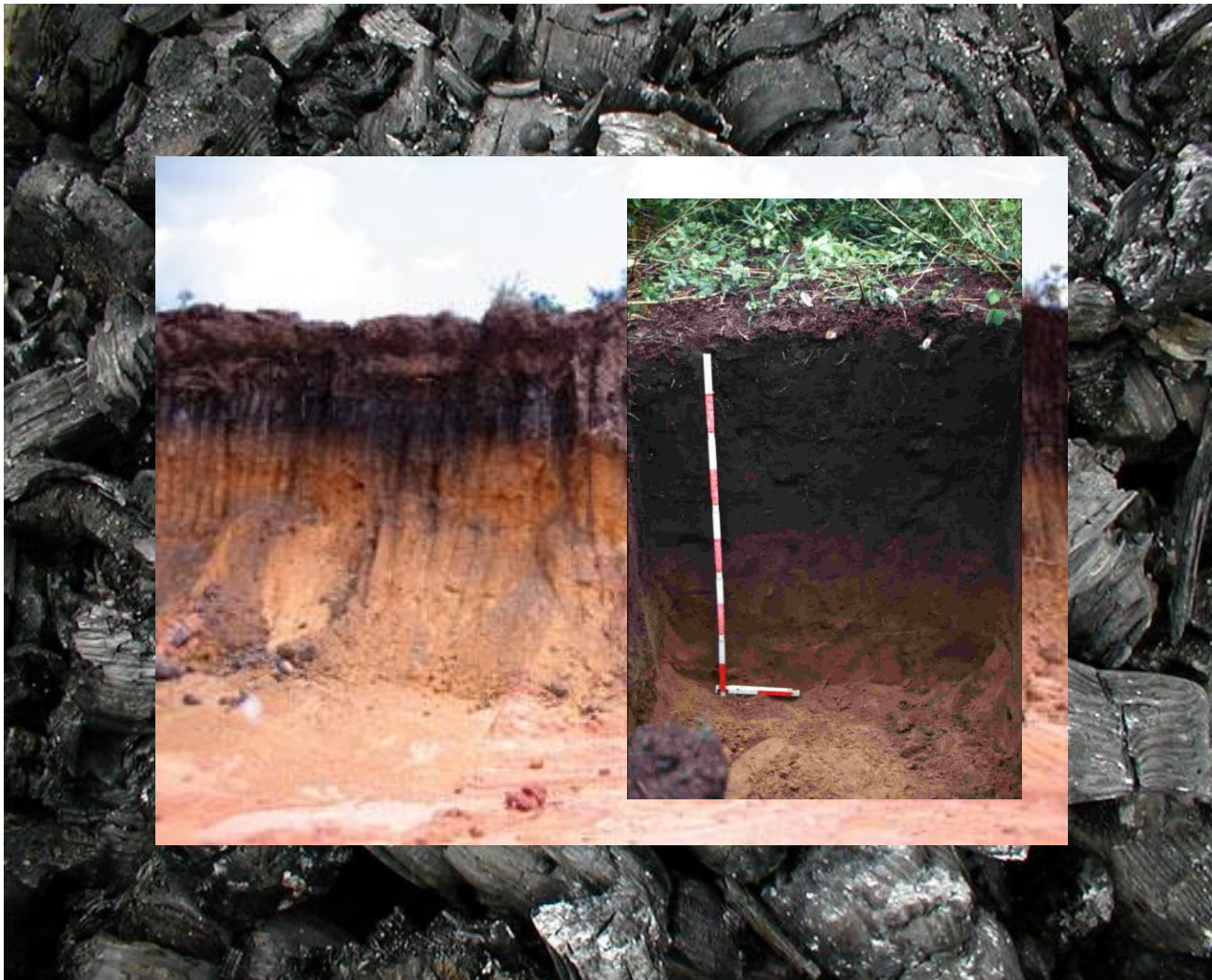


# Sustainability is Doable



- Soil & Water BMPs
- State Biomass Harvest Guidelines
- Enhanced Forest Management Plans
- Improved Forest Certif. Programs
- Look-Back Provisions for improvement

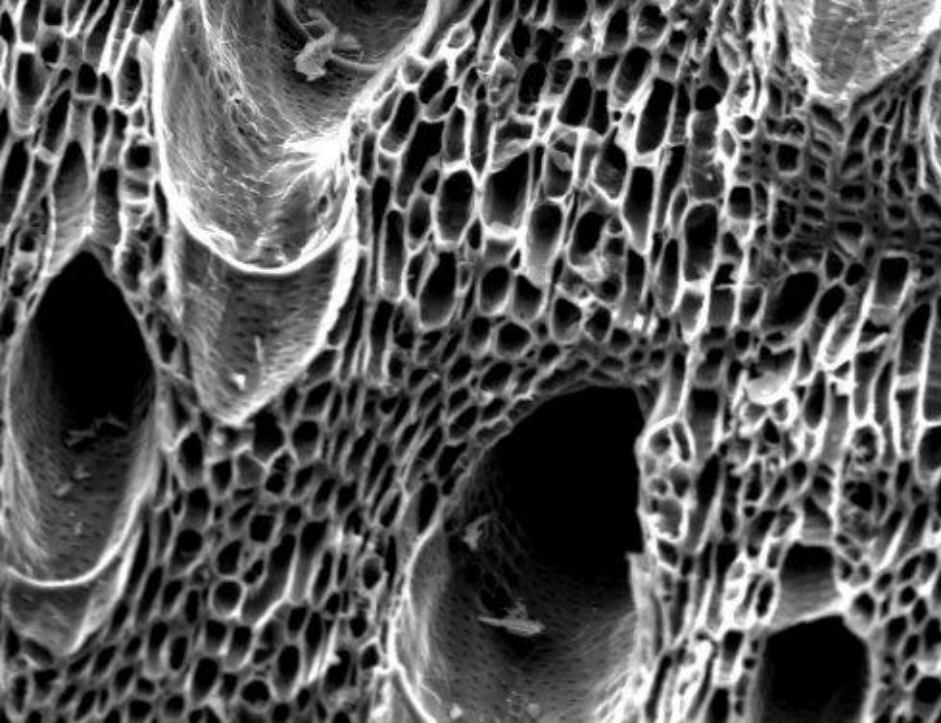
# Carbon Negative Bioenergy = Biochar



- Pyrolysis or Gasification
- >4,000 years old & very stable
- Beneficial to soil, plants & climate
- Sequesters carbon in soil
- Blocks N<sub>2</sub>O emissions







# Biochar as a soil amendment

- Increases water retention in sandy soils
- Creates habitat for good bacteria & fungi
- Boosts fertility in poor soils
- Sequesters carbon >4,000 years





# The Policies We Need

- **Strong National Renewable Electricity Standard (RES)  
25% x 2025**
- **One Broadened Definition with Sustainability Provisions**
- **Helpful State Level Policies**  
(Net Metering, Intercon. Standards, Fair Payment)

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# Questions?

**John Bonitz**

**Farm Outreach & Policy Advocacy**

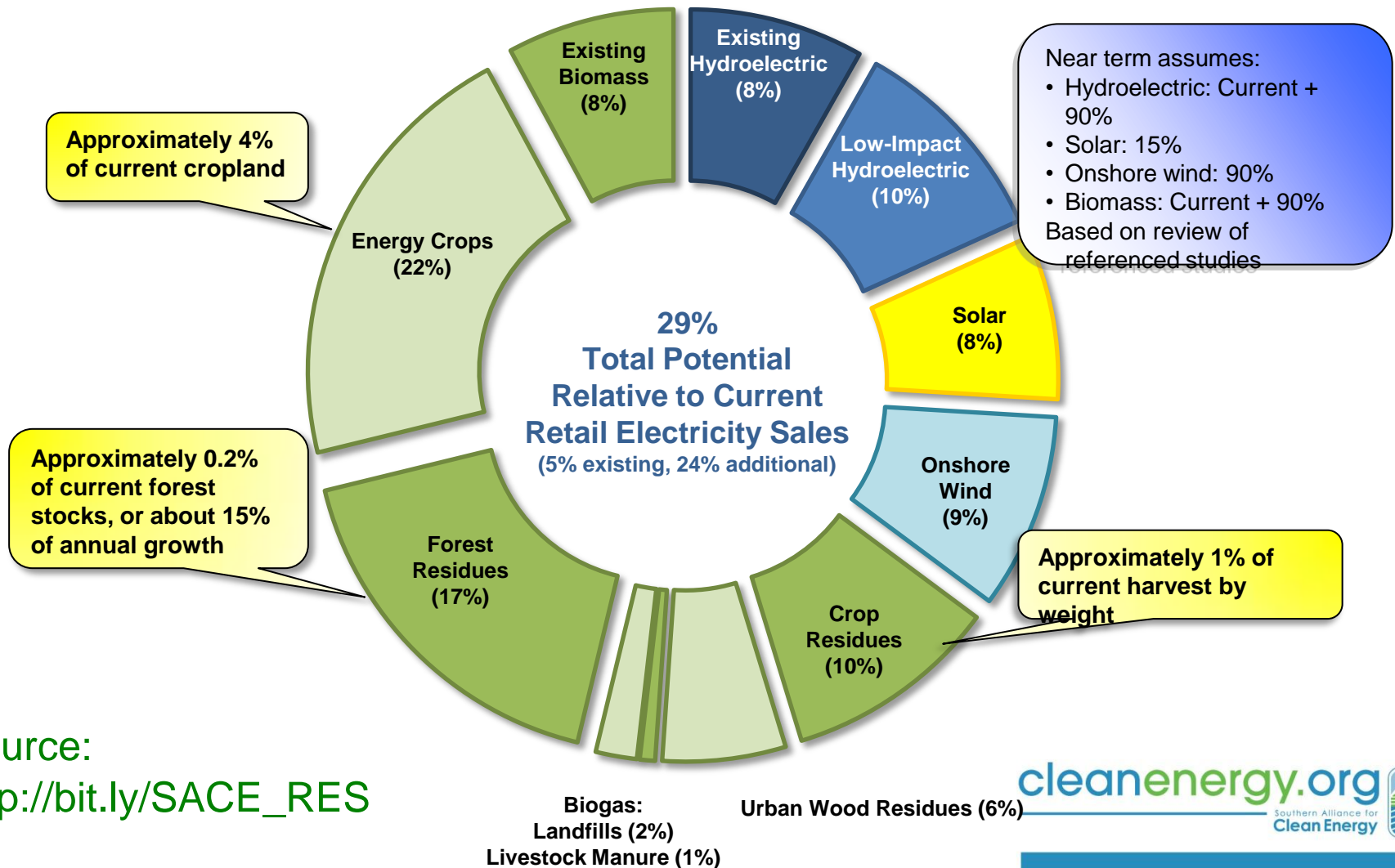
**Pittsboro, NC 919-360-2492**

**Email: [bonitz@cleanenergy.org](mailto:bonitz@cleanenergy.org)**

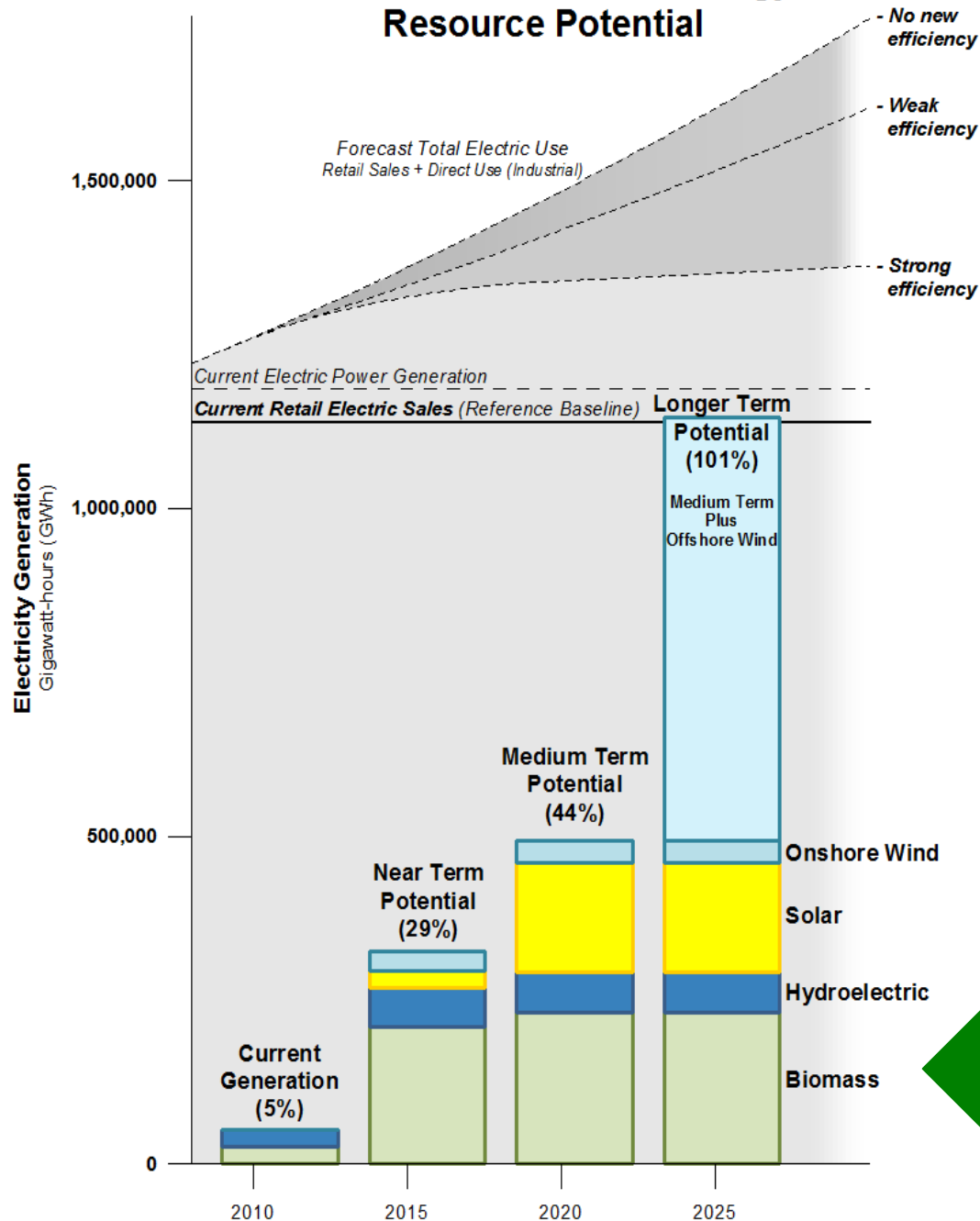




# Near Term Renewable Energy Potential



## Southeast Renewable Energy Resource Potential



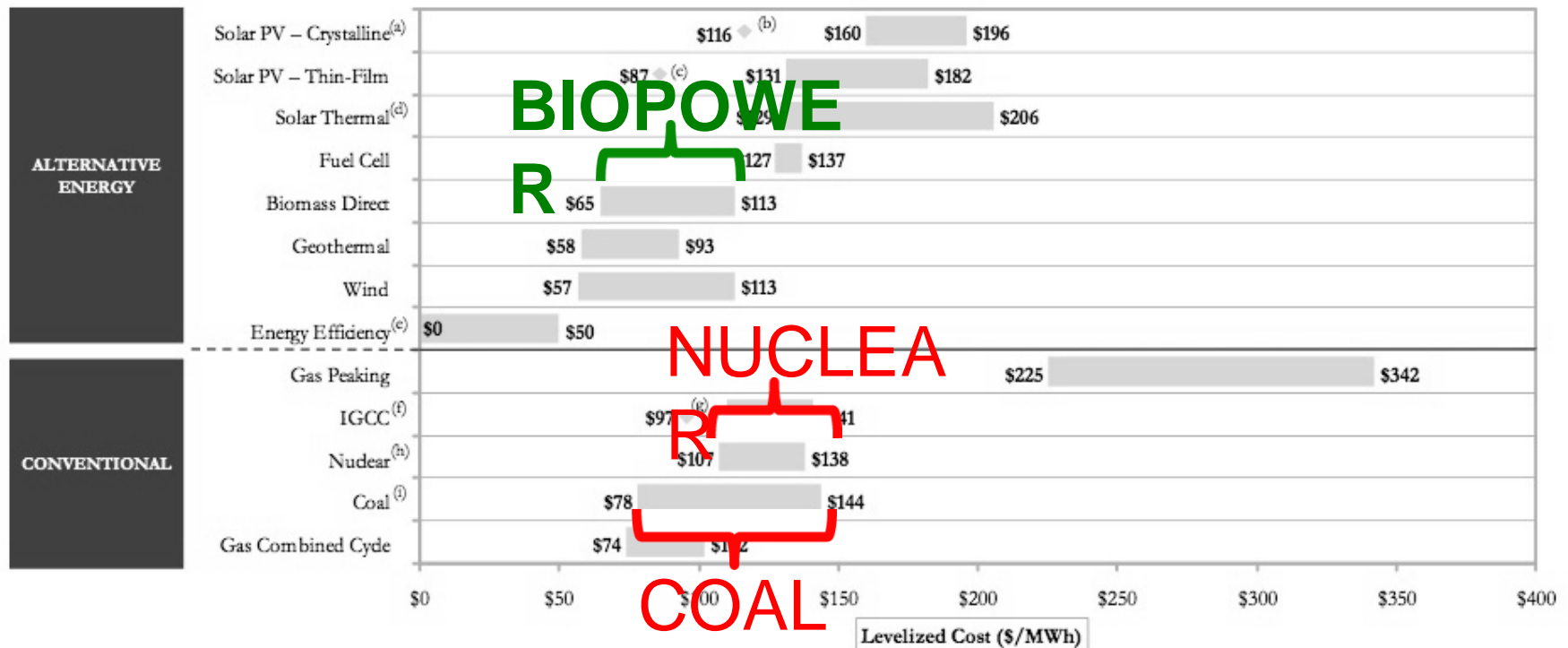
# 25% x '25

- Baseload = Reliable
- Cost-competitive
- Rapidly Deployed
- Early Workhorse
- 205,000 GWh Proj. Feasible Generation
- 2/3<sup>rd</sup>s near-term potential in RE.

# Biopower is Cost-Competitive

## Levelized Cost of Energy Comparison

Certain Alternative Energy generation technologies are already cost-competitive with conventional generation technologies under some scenarios, even before factoring in environmental and other externalities (e.g., RECs, potential carbon emission costs, transmission costs) as well as construction and fuel costs dynamics affecting conventional generation technologies



Source: Lazard's Levelized Costs of Energy, 2009  
<http://bit.ly/Lazard2009>



# Feedstock Economics?

## RELATIVE COSTS:

Wood-waste:	\$20 to \$45 / ton.
Hybrid poplar:	\$55 to \$70 / ton (projected).
Pulpwood:	\$30-\$50 / green ton (\$60-\$100 dry).
Switchgrass:	\$75 to \$90 / ton.





- Craven County Wood Energy, New Bern, NC.
- Running since 1990, 49 MW (53 MW nominal)
- Wood chips, sawdust, logging residue, urban wood debris, etc.





# Community Scale Biopower



- 25 MW in St Paul, Minn.
- FUEL: Urban Wood Waste
- DAYTIME: Heating & cooling to downtown
- Electricity to grid
- NIGHT: Cooling downtown

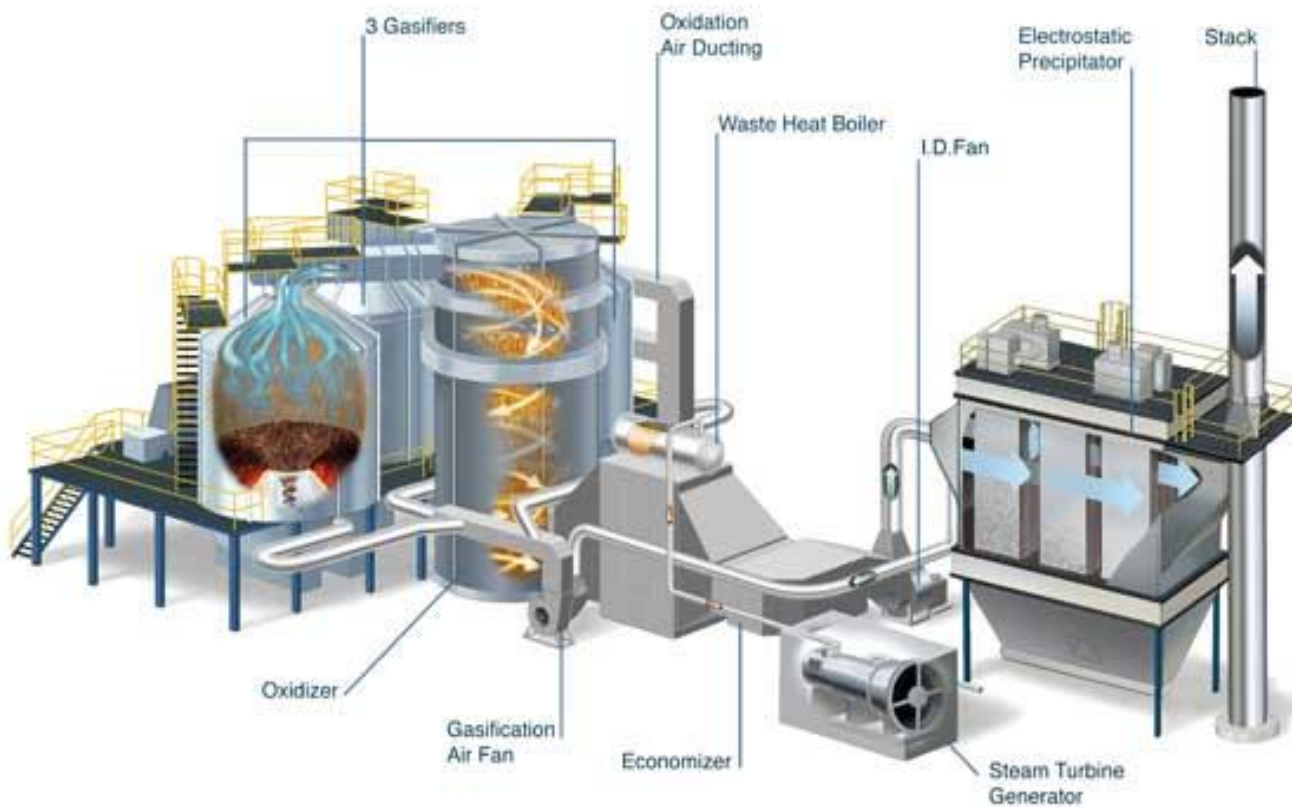
# Middlebury College Biomass



- 8.8 MW CHP
- Gasifier
- Burns wood
- Biomass replaced heating oil
- Makes power
- \$11 m project
- Endorsed by Bill McKibben



# USC Columbia Biomass



- 1.8 MW CHP
- Gasifier Burns wood
- Makes heat, power, and cooling
- Biomass replaced NG
- \$17 m project

Nexterra Biomass Gasification System at Johnson Controls' University of South Carolina Cogeneration Project.

Source:

<http://www.palletenterprise.com/article/database/view.asp?articleID=2841>



# Dr. Tom Klindt

**-University of Tennessee-**



# Susan Curtis

**-Tennessee Valley Authority-  
-Generation Partners-**



# GENERATION PARTNERS

The Time is Right for Renewable Energy





# Generation Partners – Key Features

## Features

- Pilot launched in 2003 as utility/distributor alternative to “net metering” requirements for on-site distributed generation
- Eligibility: residential, commercial, or industrial customer served by distributor
- Eligible renewable energy supply technologies:
  - **Solar** – photovoltaic panels (PV) generate direct current electricity
  - **Wind** – turns a propeller connected to a generator
  - **Biomass** – fuel includes all solid, liquid, and gaseous forms of woody waste, agricultural crops or waste, animal/other organic waste, energy crops, landfill gas and wastewater methane
  - **Low-impact hydro** – run-of-the-river type facility that consists of a turbine in a pipeline or irrigation canal

# Generation Partners – Key Features

## Features

- Pricing structure - floating premium is above consumer's retail electricity rate, including Fuel Cost Adjustment (FCA)
  - By technology
    - \$0.12 premium per kWh for solar
    - \$0.03 premium per kWh for all other eligible technologies
  - Retail Energy Rate + FCA + Premium
  - Example:  $\$0.09 + \$0.01 + \$0.12 = \$0.22/\text{kWh}$  of solar produced
- Maximum capacity up to 200 kW per site
- New Participant Incentive of \$1,000
- 10 year contract



Ruby Falls 16 kW Solar Array

# Generation Partners vs. Net Metering

## Net Metering:

- A single meter measures the difference between the electricity you consume and the electricity you generate
- When you generate more than you consume, the meter spins backwards
- You generally do not get paid for the excess power that flows to the grid; if you do, it's at a substantially low rate

## Generation Partners “Dual Metering”:

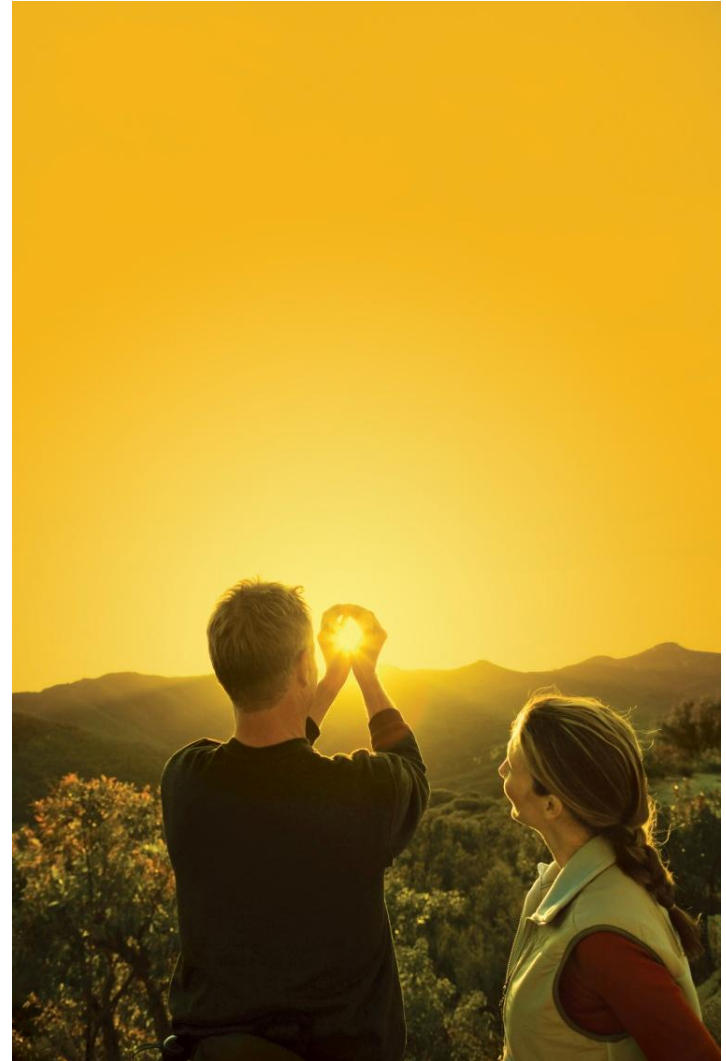
- First meter measures the electricity you consume and second meter measures the electricity you generate
- 100% of the renewable energy flows to the grid and you still receive a electricity bill for 100% of what you consume
- Wow! You get paid for 100% of the renewable energy you produce at a premium on top of the distributor's retail electricity rate, not just the excess

# Possible Business Incentives

## Potential Incentives

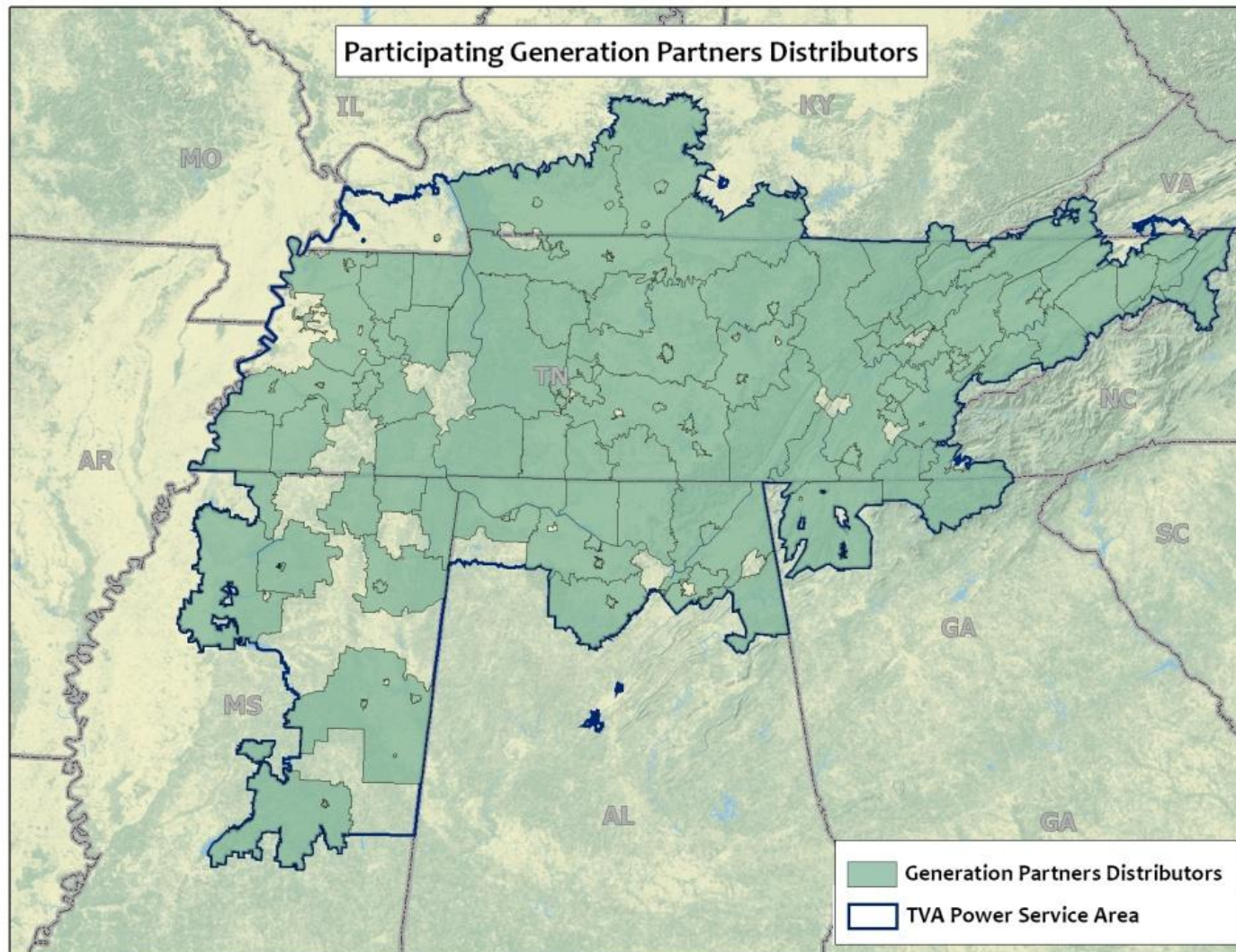
- (1) 30% Federal Tax Credit
- (2) 25% USDA Grant and
- (3) State Tax Credits (GA, NC)
- (4) TN Solar Installation Grant  
(\$1-2 per KW)
- (5) Generation Partners  
Incentive of \$1000 per new  
participant

<http://www.dsireusa.org>





# 104 Participating Distributors



# Strong Generation Partners Growth

## Completed Systems

Biomass	1	856 kW
Solar	257	3,257 kW
Wind	14	57 kW
<b>Totals</b>	<b>272</b>	<b>4,170 kW</b>

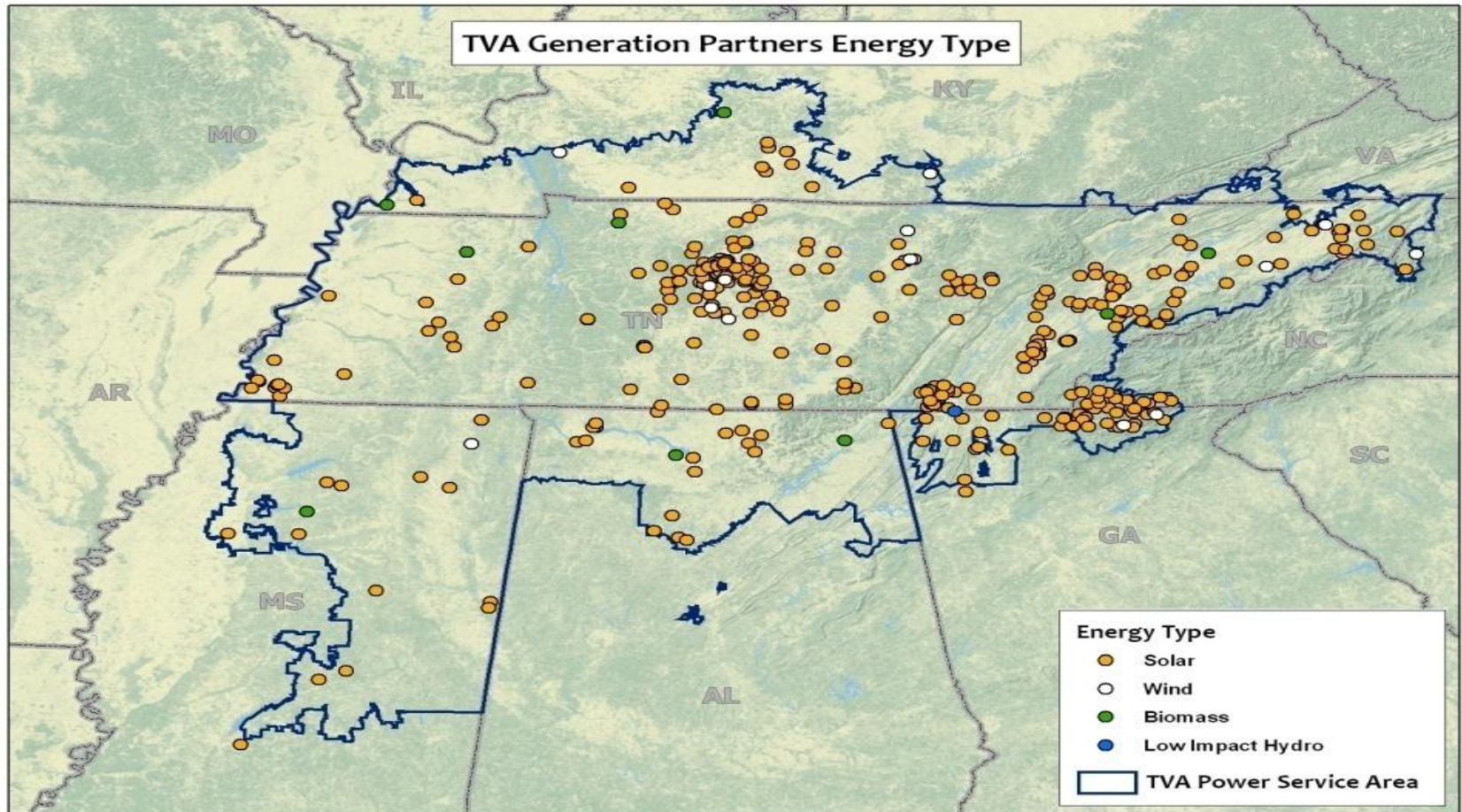
## Approved Applications (since 4/1/10)

Biomass	1	960 kW
Solar	121	20,009 kW
Wind	1	3 kW
<b>Totals</b>	<b>123</b>	<b>20,972 kW</b>



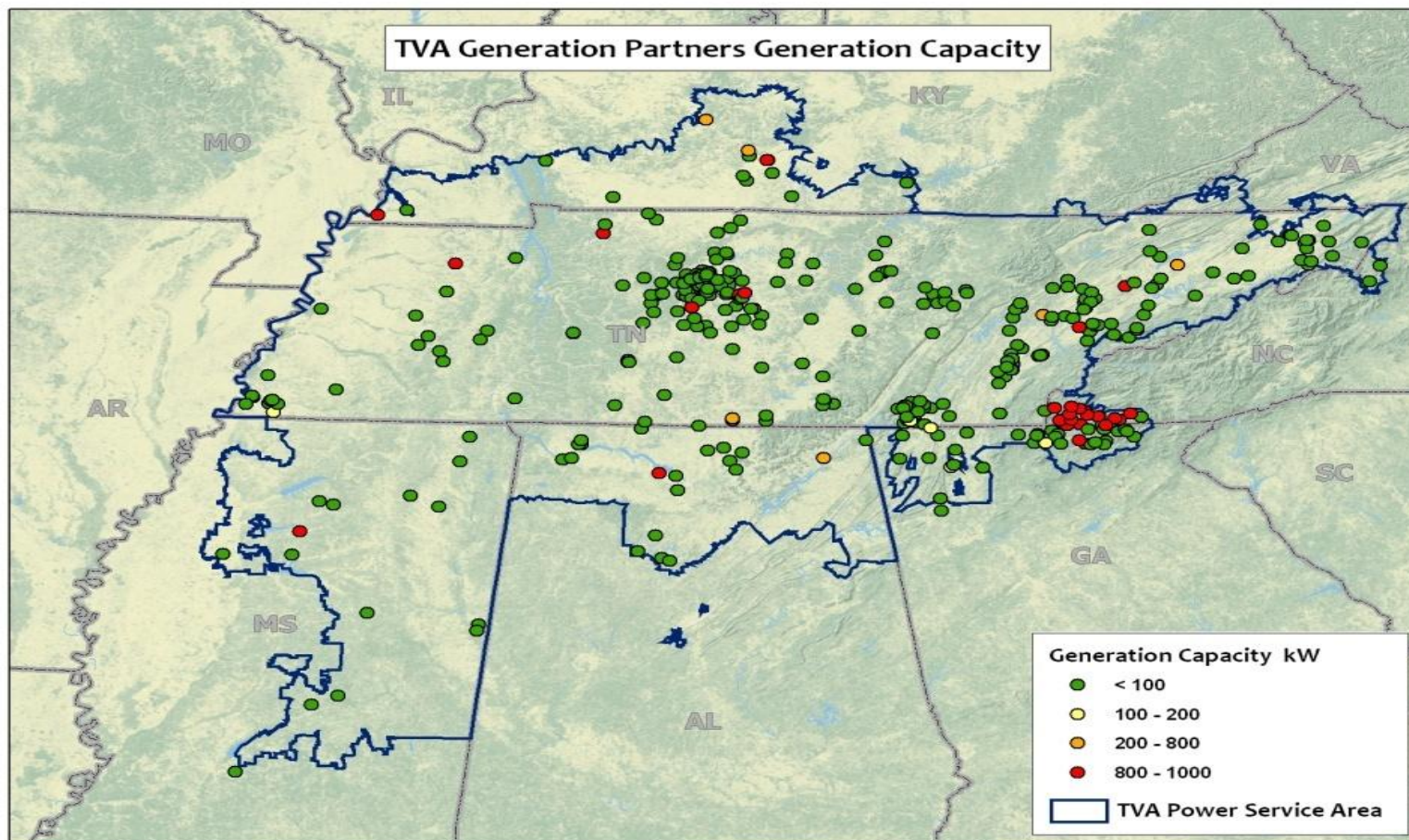


# Generation Partners Energy Type



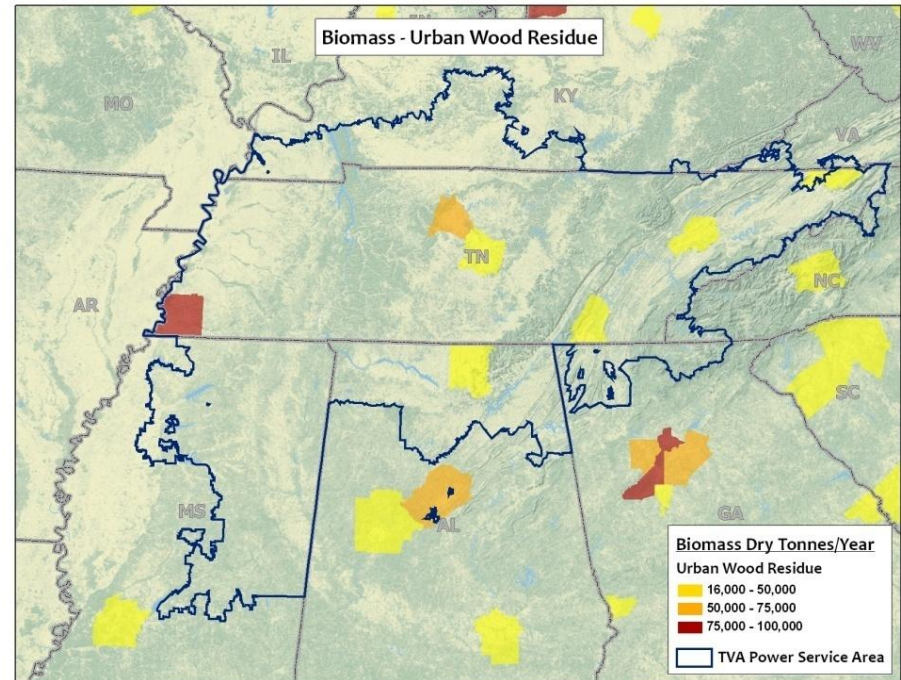


# Generation Partners Capacity



# Location of Urban Wood Waste

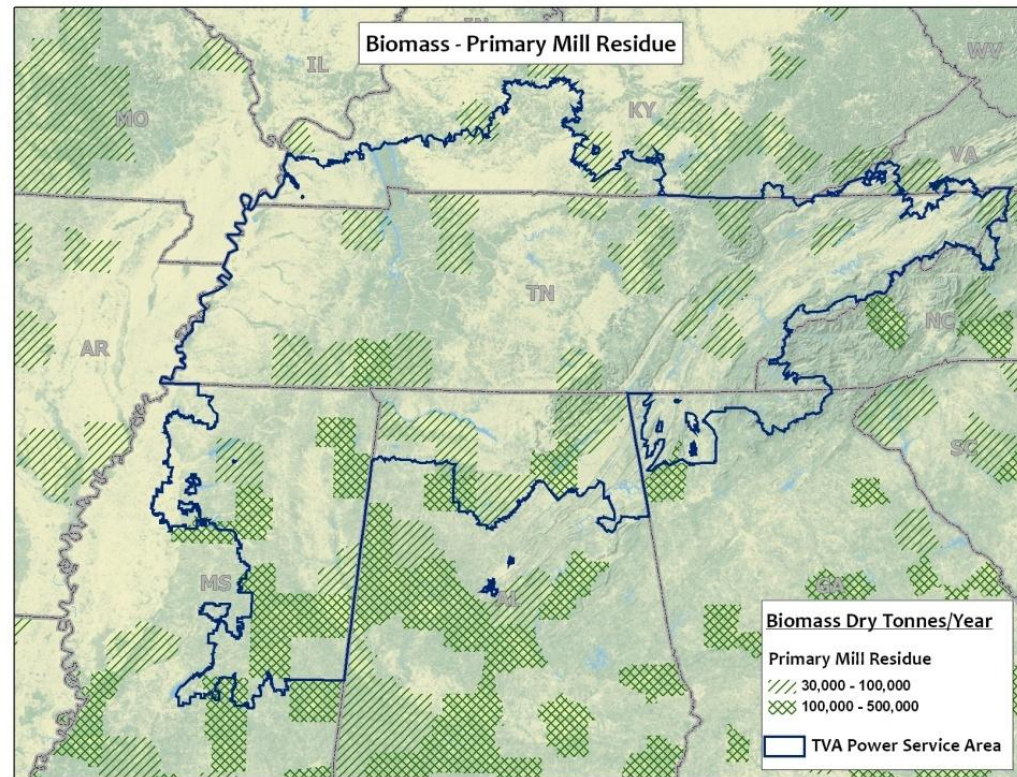
- Includes pallets, construction waste.
- The urban wood waste is concentrated in larger cities.
- Seems to be proportional to size of city.





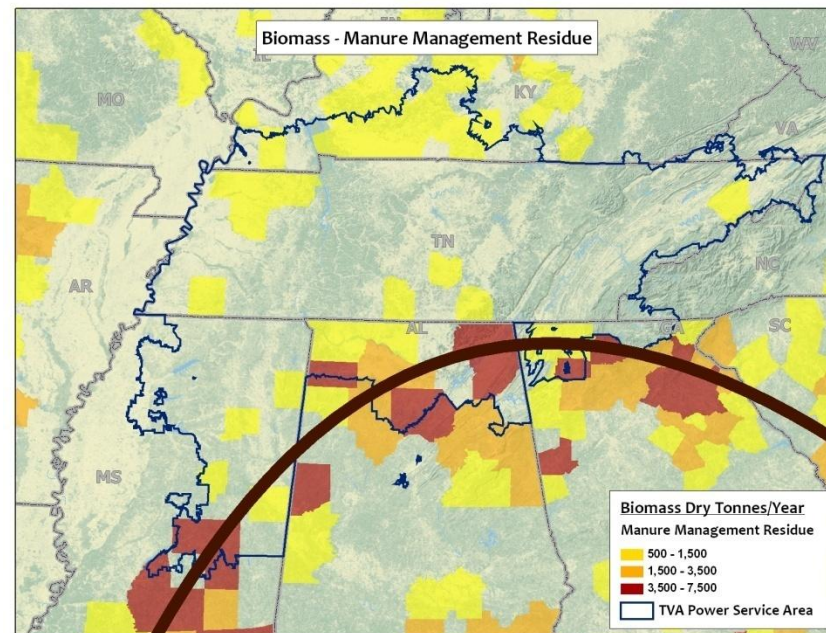
# Locations of Primary Wood Residues

- Waste from primary wood preparation such as saw mills
- Seems more prevalent at periphery of service area.



# Animal Waste

- Significant amounts in North GA & AL & South MS
- Typically use digester technologies for methane gas
- Economics better for CHP





# Why Generation Partners?

## Consumers

- Reduced energy cost
- Payment for 100% of renewable generation
- Buffers against rate increases for amount generated

## Other Benefits

- Promote a healthy environment for generations to come
- Provides a simpler method to procure and develop generation, easing the need to build more traditional power plants
- Advance economic activity and the development of renewable energy technologies
- Encourage growth in new green industries and jobs
- Green Power Switch supply

# How to Participate

- Customers contact their local power distributor
- Customer applies for interconnection and signs distributor interconnection agreement and participation agreement prior to installation
- Once project is approved, proceed with purchase and installation of qualifying system
- Start generating power and watch monthly bill go down!
- Credits occur on monthly electric bills for a period of 10 years



THANK YOU!  
Questions?



# Brent Bailey

**-25x25 Initiative-**





# Tennessee Alternative Fuels and Bioenergy Conference Wrap-Up

## Highlights and Lessons Learned

- UT lead the development of a successful switchgrass production program with 61 cooperating producers.
- MBF AgBioworks is leading outreach on value-added opportunities from new crops.
- We were reminded that we must continue to educate the public about where our food, clothing, and shelter comes from – the land!

# Tennessee Alternative Fuels and Bioenergy Conference Wrap-Up

## Highlights and Lessons Learned

- We need to be building both the feedstock production side and energy/bioproductions markets simultaneously.
- Ethanol has gotten a bad rap although it is the only domestically produced, clean burning, renewable fuel for gasoline displacement.
- We must push back against biofuel misinformation and get the truthful info out.

# Tennessee Alternative Fuels and Bioenergy Conference Wrap-Up

## Highlights and Lessons Learned

- Electric vehicles address the measures of sustainability, however there is an undeniable need for infrastructure.
- Many low carbon fuel and technology options exist.
- The growth of the UT Biofuels Initiative is a true Tennessee success story.

# Tennessee Alternative Fuels and Bioenergy Conference Wrap-Up

## Highlights and Lessons Learned

- We need to pursue biobased products that demonstrate a higher value per unit volume.
- Existing companies are eager to partner with innovative entities.
- The CRC is coordinating UT's renewable energy R&D efforts.



# Tennessee Alternative Fuels and Bioenergy Conference Wrap-Up

## Highlights and Lessons Learned

- ORNL is working towards aggressive RE/EE goals.
- BESC is working to make access to plant sugars more efficient.
- Municipalities across the state are working to implement innovative sustainability measures.

# 25x'25: Mission Achievable

## Meeting the Goal of 25x'25

Montgomery Bell State Park  
August 17, 2010



25x'25

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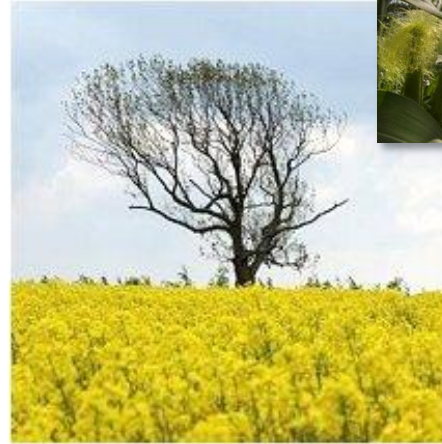
**AMERICA'S  
ENERGY FUTURE**



Bringing the Vision to Life

# The 25x'25 Vision

By the year 2025,  
America's farms,  
ranches and forests will  
provide 25 percent of  
the total energy  
consumed in the U.S.  
while continuing to  
produce safe, abundant  
and affordable food,  
feed and fiber.



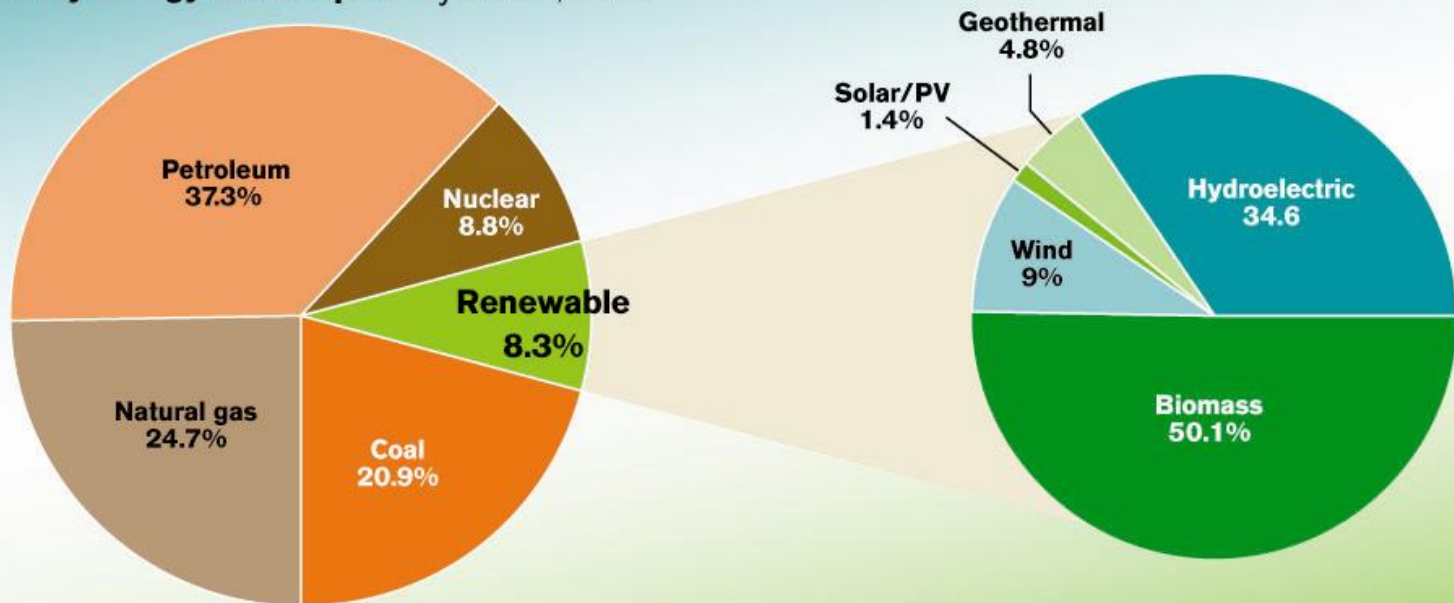
Bringing the Vision to Life



# Where We Are Now

**FIGURE 3**

**U.S. primary energy consumption** by source, 2009



SOURCE: EIA Monthly Energy Review, April 2009



Bringing the Vision to Life

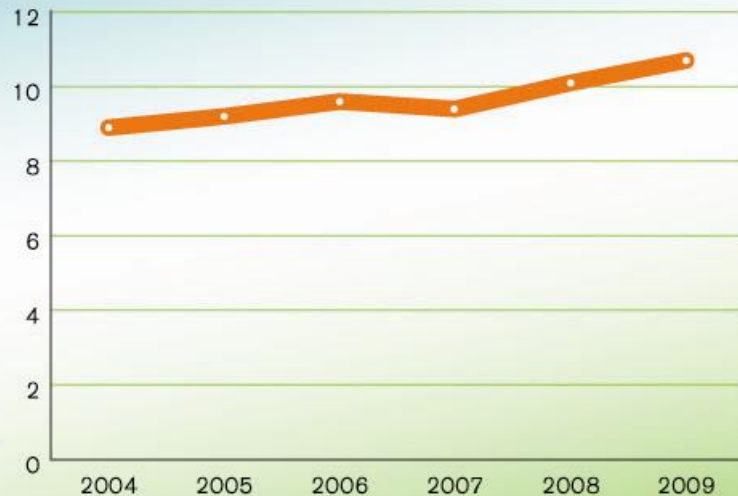
# Consumption vs. Production:

The U.S. consumes nearly **30%** more energy than it produces.

**FIGURE 1A**

**U.S. renewable energy production**  
as share of total energy production

PERCENT

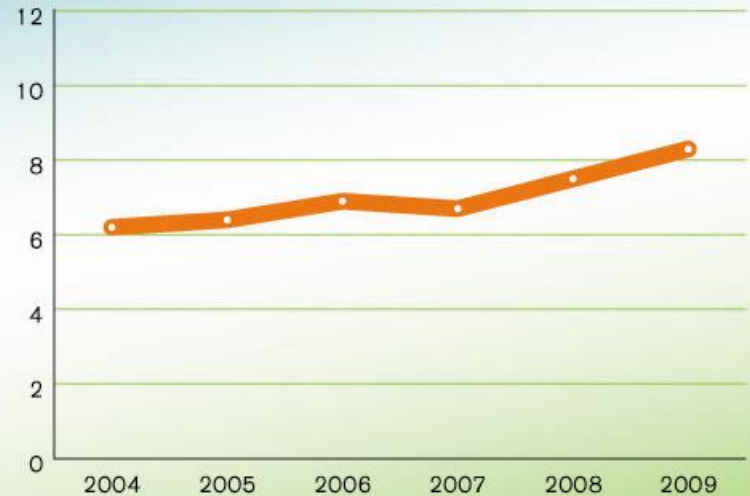


SOURCE: EIA Monthly Energy Review, April 2009

**FIGURE 1B**

**U.S. renewable energy consumption**  
as share of total energy consumption

PERCENT



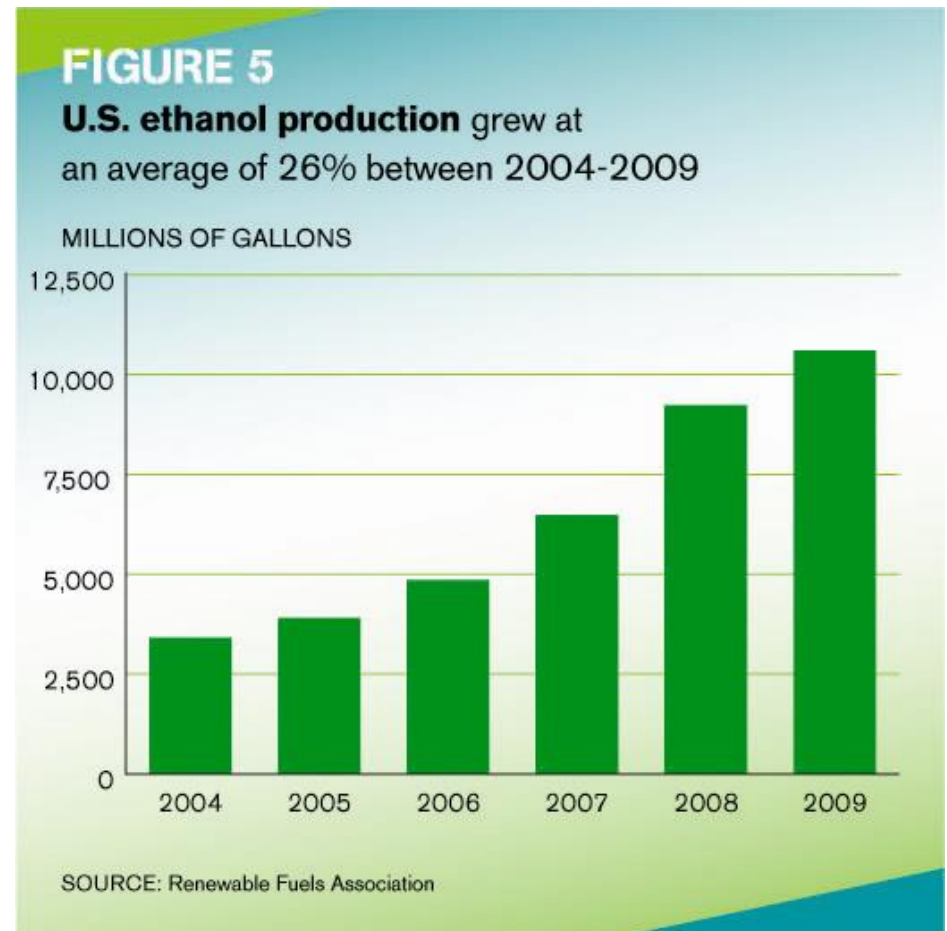
SOURCE: EIA Monthly Energy Review, April 2009



Bringing the Vision to Life

# Biofuels

- Biomass accounted for **50%** of renewable energy consumption in 2009.
- **10.8 billion gallons** of ethanol were produced in 2009, nearly tripling in the last five years.
- Biodiesel production peaked in 2008 with almost **700 million gallons**.



# Biopower

- Biomass power generates at least **15 million MW hours** of electricity annually on and off the grid.
- Biogas recovery systems produced an estimated **374 million kilowatt-hours** of useable energy in 2009.



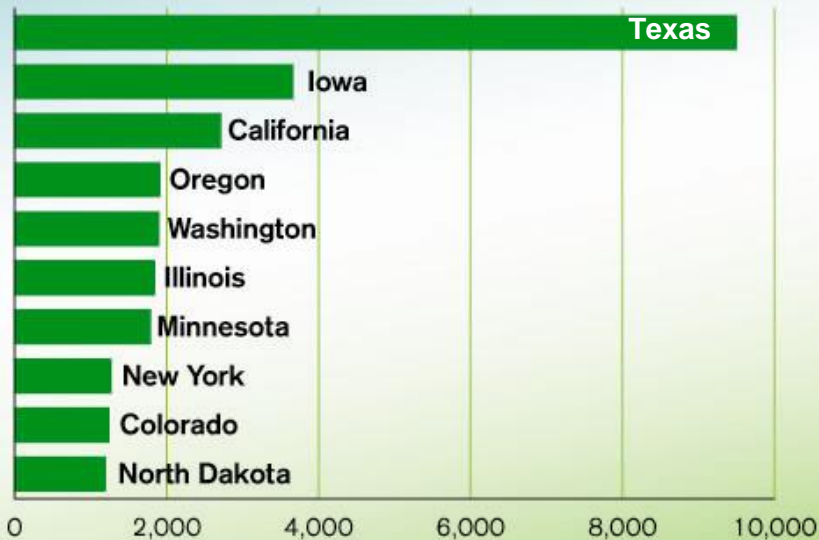


# Wind Energy

**FIGURE 8**

**Cumulative installed wind capacity**  
for the top ten states

MEGAWATTS



SOURCE: American Wind Energy Association, April 2010

- The electricity generating capacity for wind has grown an astonishing **429 %** since 2004.
- The total generating capacity is now over **35,000 MW**.
- Texas still leads states in total installed capacity with over **9,000 MW**.



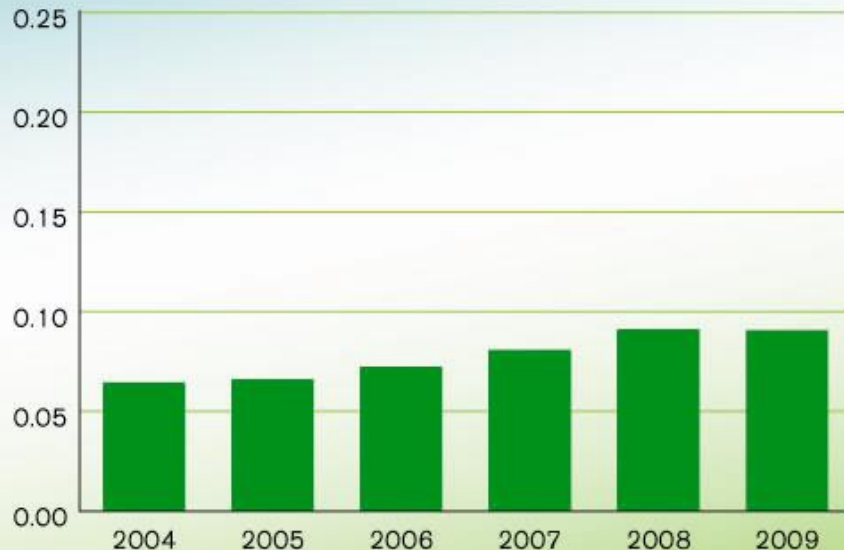
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# Solar Energy

**FIGURE 9**

**U.S. solar/photovoltaic production** grew at an average of 7% between 2004–2009

QUADRILLION BTU



SOURCE: EIA Monthly Energy Review, April 2009

- Solar energy production capacity has grown **41%** since 2004 – including solar thermal and electricity generation
- **40 MW** of solar energy were installed off the grid in 2009.
- California leads states in PV installations.
- Hawaii leads in solar thermal installations.



Bringing the Vision to Life

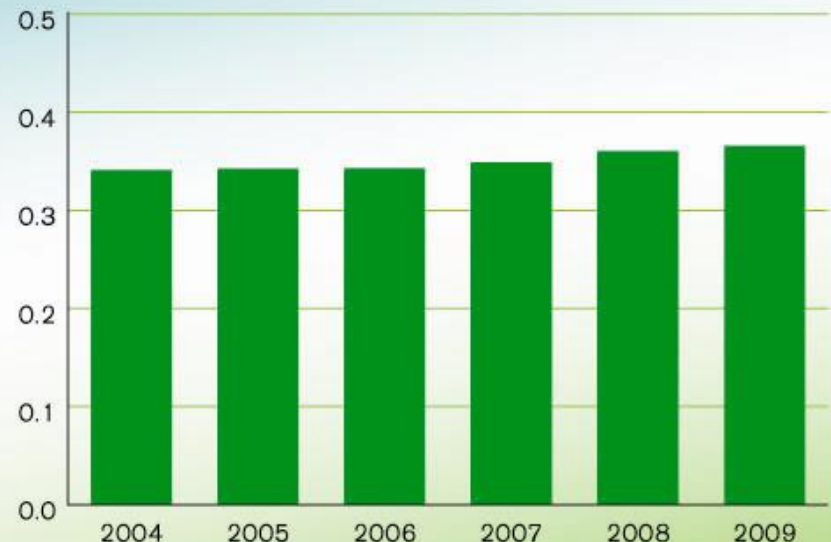
# Geothermal Energy

- Geothermal production capacity has increased **7%** since 2004.
- There are over **3,000 MW** of total installed capacity from **77 power plants**.
- With **152 projects** in development, expert estimates range from 15,000 MW to 100,000 MW online by 2025.

**FIGURE 10**

**U.S. geothermal production** grew at an average of 1% between 2004–2009

QUADRILLION BTU



SOURCE: Renewable Fuels Association [http://www.ethanolrfa.org/page/-/objects/pdf/outlook/RFAoutlook2010\\_fin.pdf?nocdn=1](http://www.ethanolrfa.org/page/-/objects/pdf/outlook/RFAoutlook2010_fin.pdf?nocdn=1)



# Hydroelectric Power

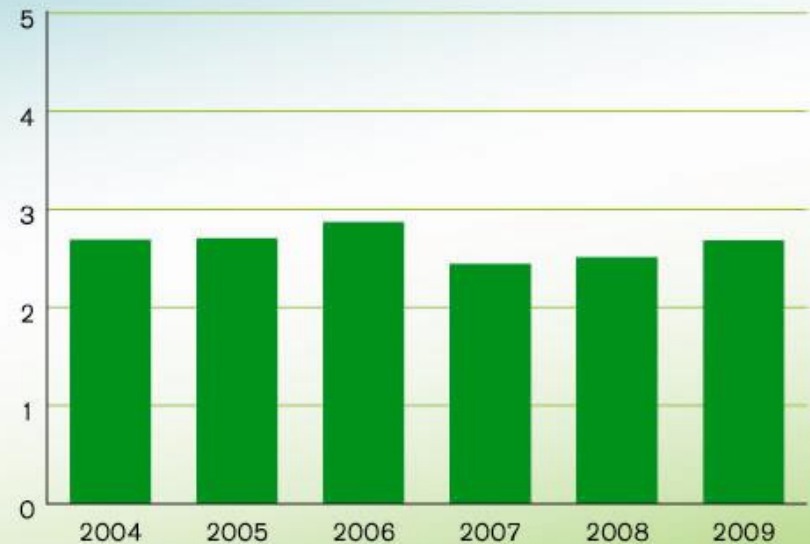
- Through facility upgrades and dam retrofits hydropower could increase as much **23,000 MW** by 2025.



**FIGURE 11**

**U.S. hydroelectric production** fluctuated but remained constant between 2004–2009

QUADRILLION BTU



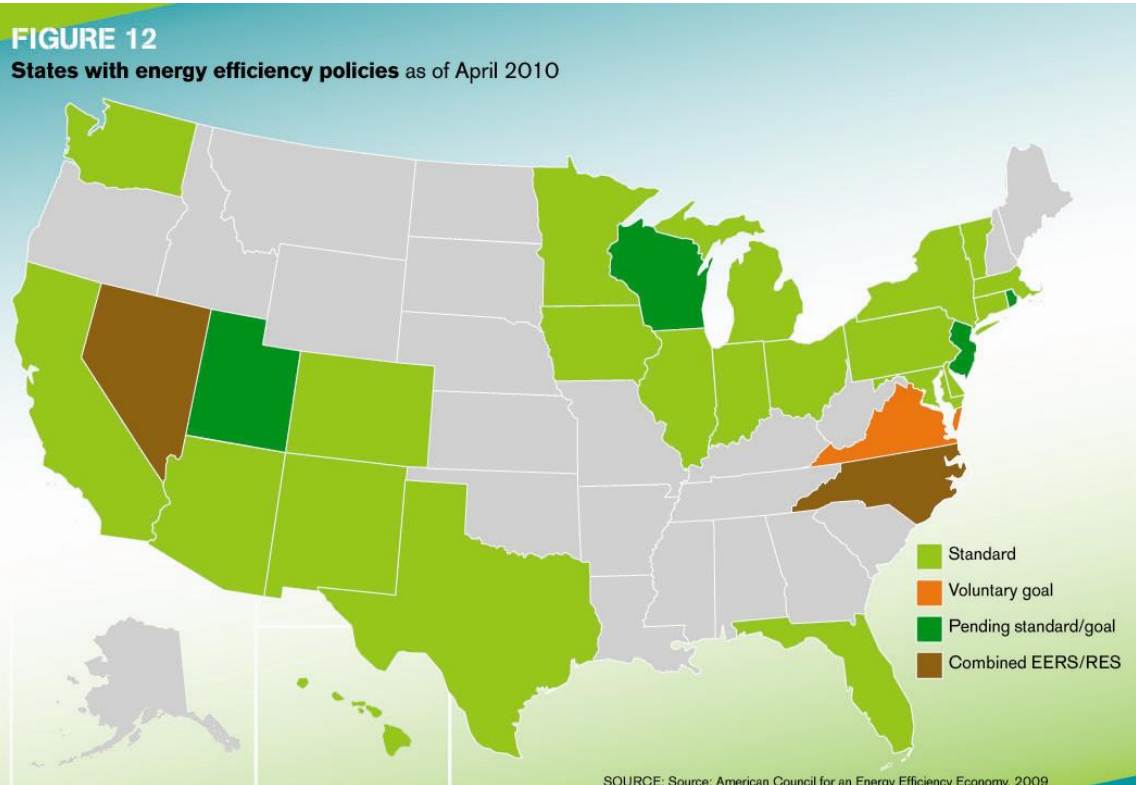
SOURCE: EIA Monthly Energy Review, April 2009



# Energy Efficiency

- The United States has met **75 percent** of its new demand for energy since 1970 by increasing the efficiency of buildings, machinery and appliances.

**FIGURE 12**  
States with energy efficiency policies as of April 2010



This map shows states that have either implemented an Energy Efficiency Resource Standard (EERS) or are in the process of implementing one.

# Challenges

- Infrastructure remains one of the biggest challenges in bringing renewable energy online.
  - Transmission lines need to be modernized and expanded to tap into rural sources of electricity, especially wind.
  - Biofuels need expanded pipelines, rail, ports and other shipping facilities to get to urban consumers; expansion of blender pumps and flex fuel vehicles are also needed.
- Significant long term *public and private investment* is needed to achieve a new, renewable energy future.
- Regulatory proposals from EPA, DOE, USDA, states, etc.



# The Path Forward

- The 25x'25 goal is achievable and significant progress has been made, but there is more to be done - all forms of renewable energy must increase production.
- Policy makers and stakeholders must understand that this is a critical need for **comprehensive energy policy** that addresses our environment, invigorates our economy and enhances our national security.



# A Call to Action

25x'25 partners need to multiply their efforts and build a bigger more effective alliance that can bring about the changes necessary to achieve a new, clean energy future.

## Join us!

[www.25x25.org](http://www.25x25.org)



Bringing the Vision to Life